electric current; however, is not determined by the amount of action which takes place, but by the intensity of the affinities concerned; and so cases may easily be produced, in which that metal exerting the least amount of action is nevertheless the positive metal in a voltaic circuit; as with copper in weak nitric acid associated with other copper in strong acid (963), or iron or silver in the same weak acid against copper in the strong acid (984). Many of those instances where the hot side ultimately becomes negative, as of zinc in dilute solution of sulphuret of potassium (941), or cadmium and lead in dilute nitric acid (943), are of this nature; and yet the conditions and result are in perfect agreement with the chemical theory of voltaic excitement (906).

946. The distinction between currents founded upon that difference of intensity which is due to the difference in force of the chemical action which is their exciting cause, is, I think, a necessary consequence of the chemical theory, and in 1834 I adopted that opinion.[1] De la Rive in 1836 gave a still more precise enunciation of such a principle,[2] by saying, that the intensity of currents is exactly proportional to the degree of affinity which reigns between the particles, the combination or separation of which produces the currents.

947. I look upon the question of the origin of the power in the voltaic battery as abundantly decided by the experimental results not connected with the action of heat. I further view the results with heat as adding very strong confirmatory evidence to the chemical theory; and the numerous questions which arise as to the varied results produced, only tend to show how important the voltaic circuit is as a means of investigation into the nature and principles of chemical affinity (955). This truth has already been most strikingly illustrated by the researches of De la Rive made by means of the galvanometer, and the investigations of my friend Professor Daniell into the real nature of acid and other compound electrolytes.[3]

Cases of two Metals and one Electrolyte; one Junction being heated

948. Since heat produced such striking results with single metals, I thought it probable that it might be able to affect the

[1] *Philosophical Transactions,* 1834, p. 428.
[2] *Annales de Chimie,* 1836, lxi. p. 44, etc.
[3] *Philosophical Transactions,* 1839, p. 97.